(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 080 438**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **82830276.0**

(51) Int. Cl.³: **B 21 D 19/04**

(22) Date of filing: **09.11.82**

(30) Priority: **19.11.81 IT 2519481**

(43) Date of publication of application: **01.06.83 Bulletin 83/22**

(84) Designated Contracting States: **AT BE CH DE FR GB LI NL SE**

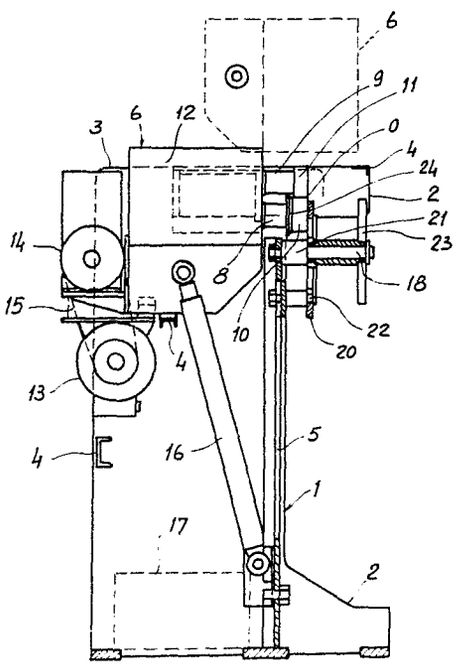
(71) Applicant: **Maggi, Pietro, Via Madonna 32, I-20017 Rho (Milan) (IT)**

(72) Inventor: **Maggi, Pietro, Via Madonna 32, I-20017 Rho (Milan) (IT)**

(74) Representative: **Calvani, Domenico, UFFICIO BREVETTI ING. CALVANI, SALVI & VERONELLI 4, Piazza Duca d'Aosta, I-20124 Milan (IT)**

(54) Flanging machine for metal sheet workpieces having a cylindrical symmetry.

(57) The object of the present invention is a flanging machine for metal sheet workpieces having a cylindrical symmetry, of the type including a pair of parallel extending roller spindles, of which one is placed over the other, the lower spindle being in a fixed position and the upper spindle being adjustable in height. According to the invention, the flanging rollers are cylindrycal in shape and the roller and spindle assembly is pivotally mounted to the machine frame in such a way that the rotation axis thereof intersects the cylindrical rollers at their tangency points. A driving means known per se causes the inclination movement of the assembly with respect to the axis of the cylindrical symmetry workpiece which is rotatably supported on suitable supports provided of the flanging machine frame.



EP 0 080 438 A2

"FLANGING MACHINE FOR METAL SHEET WORKPIECES HAVING CYLINDRICAL SYMMETRY"

The present invention generally relates to flanging machines and more particularly to a flanging machine for metal sheet workpieces having a cylindrical symmetry.

As it is known, the flanging machines are machines of small/middle power which form beads or rims on workpieces having a cylindrical symmetry, and formed of metal sheets having small/middle thickness. These flanging machines have generally a frame provided with a pair of parallel extending roller spindles of which the one is placed over the other, the lower spindle being in a fixed position and the upper spindle being adjustable in height to control the pressure exerted on and the depth of the rim.

After the metal sheet tube has been introduced between the pair of rollers and the upper roller has been adjusted, the pair of spindles are rotated and the rollers, by pressing on the metal sheet, form the rim or the beading.

Where it is desired to obtain a flange, that is a rim of rather important height, it is necessary to provide an adjustable step-shaped roller, the height of the step corresponding at least to the height of the flange to be obtained.

This involves obviously several disadvantages both from the standpoint of the plastic deformation of the metal sheet and the standpoint of the equipment since, as the metal sheet thickness increases, also the effort that the shaped rollers

have to exert on the sheet increases, so that it should be resorted to a several pass working by means of rollers having different sizes, which may jeopardize the performance of a perfect flanging operation, is time consuming and requires also finishing operations.

To sum up, with the conventional flanging machines the work to obtain the compression and bending deformation of the metal sheet, necessary for the flanging operation, is depending upon the step height of the adjustable roller, which should correspond to the height of the flange to be produced.

It is the object of the present invention to obviate to all the above-mentioned disadvantages by providing a flanging machine of a new design which does not require the use of shaped rollers which are generally subjected to remarkable shear stresses, but which permits flanges to be obtained in a single and inexp-ensive manner on metal sheet workpieces having a cylindrical symmetry and a small/middle thickness, without the necessity of resorting to roller changes during the working operations.

It is another object of the present invention to provide a flanging machine of esiest use which permits the formation of a rim and/or a flange which can take such an inclination with respect to the center line of the workpiece having a cylindrical symmetry ranging from a few degrees to 90 degrees in a manner as elemental and simple as possible, with a very good finishing level.

These and other objects of the present invention are attained by means of a flanging machine, of the type including a pair of parallel extending roller spindles, of which one is placed over the other, the lower spindle being in a fixed position and the upper spindle being adjustable in height, wherein the flanging rollers are cylindrical in shape and wherein the roller and spindle assembly is pivotally mounted on the machine frame in such a manner that the rotation axis thereof intersects the rollers at their tangency points, means being provided for causing the pivoting of this assembly with respect to the axis of the cylindrical symmetry workpiece to be flanged which is rotatably supported on the machine frame.

By means of this approach the rim or flange height does any longer depend upon the height of the step-shaped roller, but upon the length of the cylindrical rollers.

Preferably the pivotable spindle and roller assembly includes also the motor actuating the spindles and the driving thereof, thereby eliminating the provision of complex motion transmitting members.

Advantageously, the means for pivoting the above-mentioned assembly are formed of a hydraulic and/or pneumatic cylinder connected on the one hand to the machine frame and on the other hand to the pivoting assembly.

There are also provided means for rotatably supporting the cylindrical symmetry metal sheet workpiece and for guiding it during all the flanging operation.

This invention will be now described in more detail in connection with a preferred embodiment thereof, given by way of example only and therefore not intended in a limiting sense, and illustrated in the accompanying drawings, wherein:

Fig.1 shows the flanging machine according to the present invention in a side elevation view, partially broken away; and

Fig.2 shows the same machine as that illustrated in Fig.1, but in a front view, partially broken away.

Referring now to the drawings, the flanging machine according to the invention, generally indicated with the numeral 1, includes a machine frame 2 formed of a pair of side walls 3 connected to each other by cross-beams 4 and a front upright 5. Pivotally mounted to the side walls 3 by means of pins 7 is a pivoting frame 6 supporting the parallel extending spindles 8 and 9 placed one over the other, the lower spindle 8 being in a fixed position and the upper spindle 9 being adjustable in height by conventional means, not shown.

Each of the spindles 8 and 9 supports at the front end thereof a cylindrical roller 10 and 11 respectively, which are intended to perform the flanging operation.

The driving elements of the spindles 8 and 9 are enclosed within a box 12 to which the driving motor 13 is secured which is connected to a reduction gear 14 through a pulley and belt drive, generally indicated with 15. Thus, the spindles 8, 9, the cylindrical rollers 10, 11, the motor 13, the reduction gear 14 and the driving elements enclosed within the box 12 are fastened to the pivoting

frame 6. The pivoting frame 6 is also connected to the machine frame 1 through a hydraulic cylinder 16 operated by a pump 17.

On the upright 5 of the machine frame 1 a pin 18 is mounted, which carries a flanged wheel 19 supporting a calibrating ring 20 placed directly in front of the lower cylindrical roller 10 and forming an upper tangency point therewith. A spacer 21 serves to the exact positioning of the supporting flanged wheel 19 and therefore of the calibrating ring 20 in front of the lower roller 10. The calibrating ring 20 bears also on a pair of rolling bearings 22 secured to the upright 5 of the machine frame 1, in an adjustable manner to accomodate different diameters of rings 20.

The calibrating ring 20 is provided to support the end of the tube to be flanged and to prevent this tube end from being deformed during the flanging operation, since the ring has an outer diameter corresponding to the inner diameter of the tube to be flanged. At the outer end of the pin 18 a disc 23 is provided, which supports and guides the tube to be flanged, and is rotatably mounted in the pin 18.

The pivot axis 0 of the pivoting frame 6 exactly intersects the tangency points of the pair of cylindrical rollers 10, 11 therebetween and of the calibrating ring 20 with the lower roller 10.

The operation of the flanging machine according to the invention is very simple. Assume that a metal sheet tube is to be flanged having an outer diameter of 300 mm and a wall thickness of 2 mm, on the supporting wheel 19 a calibrating ring having an outer diameter of 286 mm

will be applied, which will be retained in position by the wheel 19 through the flanged portion thereof and the rolling bearings 22 will be adjusted accordingly.

Then, the tube to be flanged is inserted on the guide disc 23 and is slit until the end thereof is placed between the cylindrical rollers 10 and 11 against an abutment 24 provided on the spindle 8 acting as a stop for the edge of the tube on the rollers 10, 11.

Then, the upper roller 11 is adjusted in height until it bears against the outer surface of the tube and the motor 13 is energized, which will rotate the spindles 8 and 9 and therefore the cylindrical rollers 10, 11 and the tube.

By actuating now the hydraulic cylinder 16, the pivoting frame 6 will be slowly pivoted in a clockwise direction in Fig.1 so that the portion of the tube pressed between the rollers 10, 11 begins to bend outwardly with respect to the tube axis about the rotation axis O.

After a rotation of 90° has been attained the rollers 10, 11 lie with their axes perpendicular to the tube axis and the tube length pressed between the rollers is bent at 90° to the tube axis. Thus, it will be obtained a flange having a height corresponding to the lenght of the rollers 10, 11 and the pivoting frame 6 will be in the position shown in dashed line in Fig.1.

Thus, it can be seen that by means of the flanging machine according to this invention straight flanges having any inclination angle from a few degrees up to 90 degrees with respect to the tube axis can be obtained, and this by the simple pivotal movement of the frame 6 up to the

desired angle, which represents a great advantage both from the construction and from the operation standpoint since the compression component of the plastic deformation of the metal sheet is minimized.

By means of this flanging machine metal sheets up to 8 mm of thickness and tube sectionshaving a nearly infinite theoretical length can be obtained since the tube is not subjected to axial movements during all the flanging operation.

While the invention has been described and shown in connection with an embodiment only, it will be apparent to those skilled in the art that various changes and modifications can be made thereto without departing from the scope thereof.

CLAIMS

1) A flanging machine for workpieces having a cylindrical symmetry of the type comprising a pair of parallel extending roller spindles, of which one is placed over the other, the lower spindle being in a fixed position and the upper spindle being adjustable in height, wherein the flanging rollers are both cylindrical in shape and wherein the spindle and roller assembly is pivotally mounted on the machine frame such that its rotation axis intersects the rollers at their tengency points, means being provided for causing the pivoting movement of said assembly with respect to the axis of the workpiece to be flanged, which is rotatably supported on the machine frame by suitable means.

2) A flanging machine as claimed in claim 1, wherein said pivoting assembly includes the motor rotating the spindles and the associated driving elements, thereby eliminating the provision of complex motion transmitting members.

3) A flanging machine as claimed in claim 1, wherein said means for causing the pivoting movement of said assembly include a hydraulic and/or pneumatic cylinder connected on the one hand to the machine frame and on the other hand to said pivoting assembly.

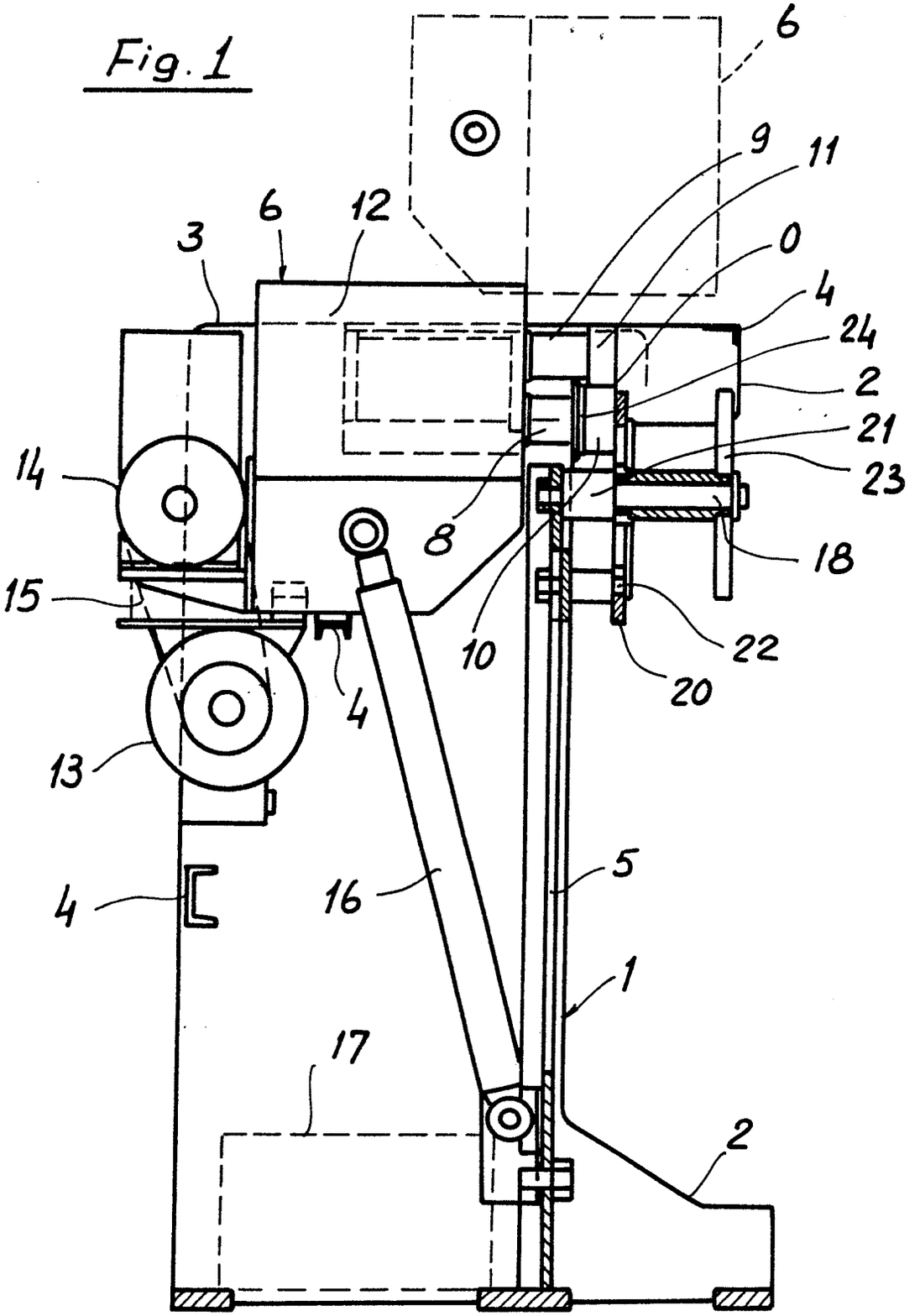
4) A flanging machine as claimed in claim 1, wherein means are provided for rotably supporting the metal sheet workpiece having a cylindrical symmetry and for guiding it during all the flanging operation.

5) A flanging machine as claimed in claim 4, wherein said means for rotatably supporting the workpiece having a cylindrical symmetry comprise a ring having an outer diameter corresponding to the inner diameter of the workpiece and so arranged as to form an upper tangency point with the lower roller, said ring being supported by a wheel rotatably mounted on the machine frame.

6) A flanging machine as claimed in claim 4, wherein said means for guiding the workpiece having a cylindrical symmetry include at least two rolling bearings contacting the periphery of said ring and a disc rotatably mounted on the machine frame.

0080438

Fig. 1



0080438

Fig. 2